EXECUTIVE BRIEFING REPORT: SALES & CLIMATE CORRELATION ANALYSIS IN ALBERTA, BRITISH COLOMBIA AND ONTARIO (2013–2022)

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Contents

Objective & Approach

The analysis investigates how climate factors—temperature and precipitation—impact retail sales across Alberta, British Columbia, and Ontario, aiming to inform inventory, marketing, and staffing strategies.

We examined decade-long monthly data to identify correlations and actionable patterns. The approach combined statistical analysis with industry-level segmentation, supported by visual dashboards for clarity.

Data Summary

Data sources included Statistics Canada retail trade tables[i] and Environment Canada climate records[ii].

To establish a reliable basis for correlation analysis, climate datasets were first consolidated and harmonized, ensuring consistency across all sources. Standardizing date formats eliminated temporal discrepancies, while organizing retail industries into 11 categories enabled meaningful segmentation for comparative insights. Monthly averages were calculated to smooth short-term fluctuations and highlight underlying trends. Null values were retained deliberately, as their negligible proportion was assessed to have no material impact on analytical validity, thereby preserving data integrity. Finally, datasets were integrated by province, year, and month, creating a structured and coherent framework that enhances reproducibility and supports robust statistical inference.

Key Insights

Sales and Climate Correlation in Three Provinces

Ontario leads in total sales despite moderate climate conditions, BC is warmest and wettest but ranks second, and Alberta is coldest and driest with the smallest sales volume.

Sales in **Alberta** have shown strong seasonal patterns over the past decade, with consistent peaks and troughs, while overall growth has remained stable. Analysis of weather factors indicates that **precipitation has virtually no impact on sales**, with correlations fluctuating near zero historically and remaining negligible in the forecast period. In contrast, **temperature exhibits a mild positive correlation with sales**, suggesting that warmer quarters align with slightly higher demand, a trend expected to persist.

Forecasts for 2023 show sales stability with continued seasonal variation, while temperature remains a minor but consistent driver.

These findings imply that weather-based strategies should focus on temperature-driven seasonality rather than precipitation, as the latter offers no predictive value. Incorporating temperature as a secondary variable in forecasting models can help fine-tune inventory and promotional planning.

Sales in **British Columbia** have maintained strong seasonal patterns with steady growth over the past decade. Analysis of weather factors shows that **precipitation has no significant impact on sales**, with correlations fluctuating near zero historically and remaining negligible in the forecast period. In contrast, **temperature demonstrates a mild positive correlation with sales**, indicating that warmer quarters tend to align with slightly higher demand—a trend expected to persist, though slightly weaker in the forecast horizon.

Sales projections for 2023 suggest continued stability with seasonal peaks, while weather-related effects remain secondary.

These findings imply that precipitation can be excluded from predictive models, whereas temperature should be considered as a minor seasonal driver to optimize inventory and promotional strategies. Overall, weather factors do not dominate sales performance, but temperature offers modest value for fine-tuning forecasts.

Sales in **Ontario** continue a **stable upward path** with **pronounced seasonal peaks**, particularly in **warmer quarters (Q2–Q3)**. Weather analysis shows **precipitation has little to no influence** on demand—historically **near-zero to mildly negative correlations** that are expected to remain **negligible** in the forecast window. By contrast, **temperature exhibits a small but persistent positive correlation** with sales, indicating warmer conditions modestly lift demand; this effect is expected to **persist, though remain modest**, through 2023.

The outlook points to **continued growth with normal seasonal variability**, suggesting operations should **ramp inventory and staffing ahead of warmer seasons** and temper stock levels in cooler quarters. For forecasting, rely on **seasonal components and include temperature as a secondary regressor**, while **excluding or heavily down-weighting precipitation**; complement models with **holiday/promotion controls, category-level sensitivity checks, and lag tests**.

Marketing should **time promotions to warmer periods** and avoid precipitation-based triggers, using a lightweight **monthly correlation dashboard** to monitor shifts by category and region.

Climate Correlation Across Alberta, British Columbia, and Ontario:

Sales across all three provinces exhibit **strong seasonal patterns and steady growth**, with climate factors playing only a **secondary role**. Analysis shows **precipitation has negligible influence on sales** in every province—historically fluctuating near zero and remaining insignificant in forecasts, with Ontario showing a mild negative tendency. In contrast, **temperature consistently demonstrates a small positive correlation with sales**, indicating warmer quarters align with slightly higher demand; this effect is most pronounced in Ontario, moderate in Alberta and British Columbia, and expected to persist across all regions through 2023.

Forecasts for all provinces point to **continued stability with seasonal peaks**, reinforcing that **seasonality and promotional cycles are primary drivers**, while temperature can be used as a **minor adjustment factor** in predictive models.

Business strategies should **exclude precipitation from planning**, incorporate **temperature as a secondary regressor**, and focus on **inventory and marketing alignment with warmer seasons**. Extreme weather scenarios (e.g., heat waves) warrant monitoring for short-term demand spikes, but overall, climate factors do not dominate sales performance.

Sales and Climate Correlation Across All 11 Industries in Three Provinces

Across Alberta's retail landscape, temperature shows a generally positive influence on sales for most industries, while precipitation remains weak and inconsistent. The strongest temperature sensitivity appears in Building Material & Garden Equipment (≈ +0.75), followed by Gasoline Stations, General Merchandise, Furniture, Miscellaneous Stores, and Motor Vehicle & Parts Dealers (≈ +0.10–0.30). These sectors benefit from warmer conditions, reinforcing the need for seasonal ramp-ups in Q2–Q3 for inventory, staffing, and promotions. In contrast, Food & Beverage is nearly neutral, and Clothing shows minimal climate impact, suggesting demand is more calendar-driven than weather-dependent.

Conversely, Electronics & Appliances, Sporting Goods, Hobby, Book & Music, and Health & Personal Care exhibit near-zero or negative temperature correlations, indicating climate factors are not reliable drivers for these categories. Precipitation adds little predictive value overall, except for a modest positive effect in Building Materials and slight lifts in Gasoline, General Merchandise, and Auto Dealers. For these low-sensitivity sectors, planning should focus on holiday cycles, promotional calendars, and macroeconomic factors rather than climate signals. Forecasting models should include temperature as a secondary regressor for high-sensitivity industries and exclude or down-weight precipitation across the board.

In BC, temperature effects are moderate and concentrated in mobility and outdoor-linked sectors, while precipitation plays a more significant role than in Alberta. The strongest temperature sensitivity appears in Gasoline Stations (≈ +0.38) and Building Material & Garden Equipment (≈ +0.34), with smaller positives for General Merchandise, Furniture, Miscellaneous Stores, and Motor Vehicle & Parts Dealers (≈ +0.05–0.10). Several industries lean neutral or negative, including Electronics & Appliances (≈ –0.28), Health & Personal Care (≈ –0.22), and Sporting Goods (≈ –0.08), while Clothing and Food & Beverage hover near zero. These patterns suggest that temperature-driven planning should focus on seasonal ramp-ups for building materials and fuel, while other categories rely more on calendar events and promotions.

Precipitation correlations in BC are stronger and more varied, with notable positives for Electronics & Appliances (≈ +0.38), Sporting Goods, and Health & Personal Care (≈ +0.18–0.22). Conversely, Building Materials and Gasoline Stations show negative precipitation effects (≈ –0.28), indicating wetter conditions may suppress demand in these categories. Other sectors, such as General Merchandise, Furniture, and Miscellaneous Stores, exhibit small positive precipitation signals. For forecasting, weight precipitation more heavily for electronics, sporting goods, and health/personal care, while temperature remains relevant for outdoor and mobility-linked sectors. Neutral or negative temperature industries should prioritize holiday cycles, promotional calendars, and macroeconomic factors over climate signals.

In Ontario, temperature shows a clear positive influence on several major retail sectors, led by Building Material & Garden Equipment (≈ +0.60) and Gasoline Stations (≈ +0.33). Other categories with mild positive temperature sensitivity include General Merchandise, Furniture, Miscellaneous Stores, and Motor Vehicle & Parts Dealers (≈ +0.12–0.18). Food & Beverage and Clothing hover near neutral, while Electronics & Appliances and Health & Personal Care exhibit slight negative correlations (≈ –0.10), suggesting climate factors are less relevant for these categories. These patterns indicate that temperature-driven planning should focus on seasonal ramp-ups for building materials and fuel, while other sectors rely more on calendar events and macroeconomic drivers.

Precipitation correlations in Ontario are generally weak but positive across most industries, with small lifts for Building Materials, Gasoline Stations, General Merchandise, and Sporting Goods (≈ +0.08–0.20). Negative precipitation effects are minimal, appearing only in isolated categories. Overall, precipitation remains a secondary signal, far less influential than temperature. For forecasting, include temperature as a secondary regressor for high-sensitivity sectors and use precipitation sparingly, while emphasizing holiday cycles,

promotional calendars, and economic conditions for neutral or negative climate categories.

In general, high-sensitivity sectors across provinces include Building Materials, Gasoline, and Motor Vehicle Dealers. Neutral sectors: Food & Beverage, Clothing. Negative or negligible: Electronics & Appliances, Health & Personal Care. Notable BC precipitation effect on Electronics (+0.38) and Ontario Building Materials (+0.60).

Forecast Implications

Temperature remains a modest but persistent driver through 2023; include as secondary regressor for climate-sensitive sectors. Precipitation adds noise and should be excluded. Seasonal cycles and promotional calendars remain primary drivers. Example: Ontario should ramp inventory for Q2–Q3; Alberta should focus on Building Materials and Gasoline Stations.

Visualization Rationale

Correlation panels clearly conveyed climate-sales relationships, while seasonality charts highlighted recurring Q2–Q3 peaks and Q4 holiday lifts. Industry dashboards enabled quick comparison of climate sensitivity across sectors, making insights actionable for both technical and non-technical stakeholders.

Strategic Recommendations

Incorporate temperature as a secondary regressor in forecasting models and exclude precipitation, given its negligible predictive value. Align inventory and marketing strategies with established seasonal peaks and implement contingency plans to manage short-term demand fluctuations during extreme temperature events.

Prioritize high-sensitivity sectors—such as Building Materials, Gasoline, and Motor Vehicle Dealers—by planning inventory and marketing initiatives in advance to capture seasonal demand.

For annual planning, treat climate as a secondary factor, as its long-term impact on sales is minimal. Over a ten-year horizon, strategic planning should focus on more influential drivers, including demographic trends, immigration policies, and tax regulations, which exert significantly greater influence on market dynamics and growth potential.

Appendix: Visuals from Original Presentation

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Showing 14 records Filter Reset

North American Industry Classification System (NAICS)	Retail trade [44-45]				
Adjustments	Seasonally adjusted				
Geography	August 2022	September 2022	October 2022	November 2022	December 2022
	Dollars				
Canada (map)	61,436,871[A]	61,043,913[A]	61,814,032[A]	61,788,075[A]	62,122,558[A]
Newfoundland and Labrador (map)	931,693[A]	916,938[A]	941,077[A]	915,038[B]	921,506[B]
Prince Edward Island (map)	272,028[B]	264,454[A]	280,934[A]	280,097[B]	278,806[B]
Nova Scotia (map)	1,643,701[A]	1,614,045[A]	1,706,821[A]	1,701,732[A]	1,685,421[A]
New Brunswick (map)	1,351,208[A]	1,360,538[A]	1,421,317[A]	1,372,413[A]	1,360,389[A]
Quebec (map)	13,841,497[A]	13,625,373[A]	14,001,401[A]	13,983,201[A]	14,132,157[A]
Ontario (map)	22,277,448[A]	22,510,264[A]	22,417,880[A]	22,420,167[A]	22,632,634[A]
Manitoba (map)	2,169,964[A]	2,134,604[A]	2,185,909[A]	2,212,917[A]	2,198,603[A]
Saskatchewan (map)	2,063,517[A]	2,070,611[A]	2,120,576[A]	2,112,060[A]	2,107,361[A]
Alberta (map)	8,072,334[A]	7,954,628[A]	8,065,198[A]	8,070,670[A]	8,183,031[A]
British Columbia (map)	8,607,565[A]	8,387,672[A]	8,462,804[A]	8,513,399[A]	8,416,964[A]
Yukon (map)	87,605[A]	83,987[A]	86,169[A]	85,573[A]	84,685[A]
Northwest Territories (map)	71,237[A]	73,431[A]	74,574[B]	71,328[A]	72,061[B]
Nunavut (map)	47,074[A]	47,366[A]	49,371[A]	49,479[A]	48,942[A]

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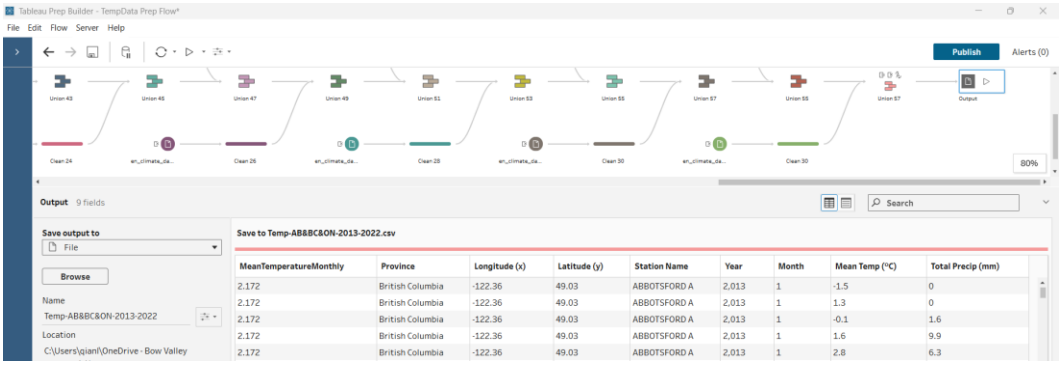

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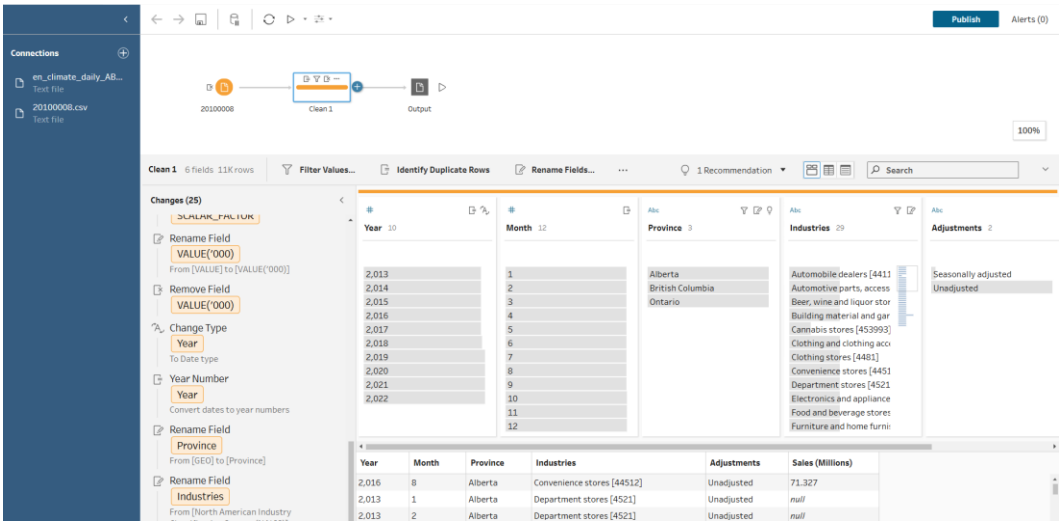

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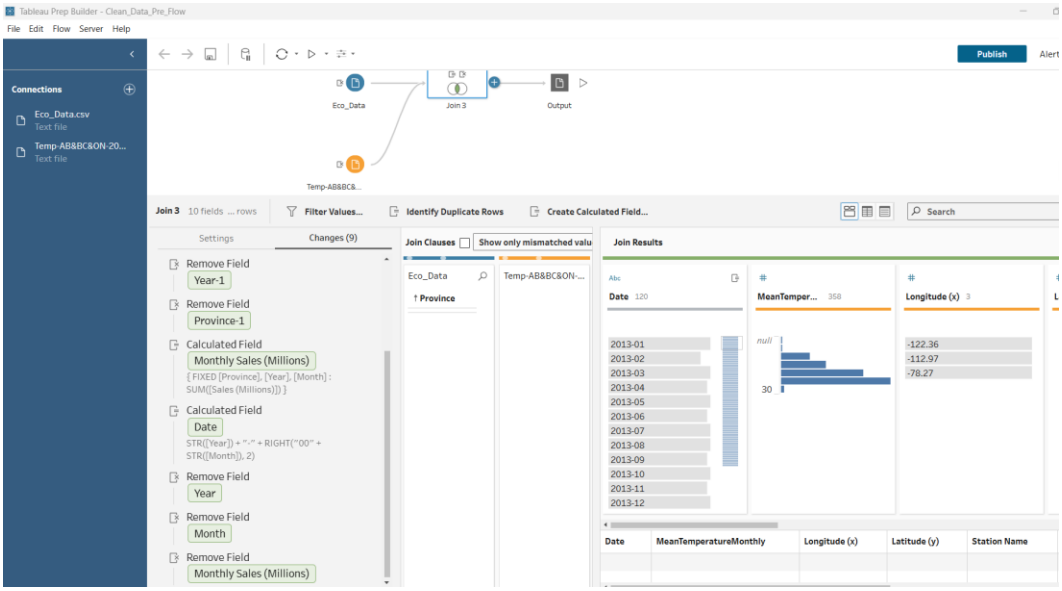

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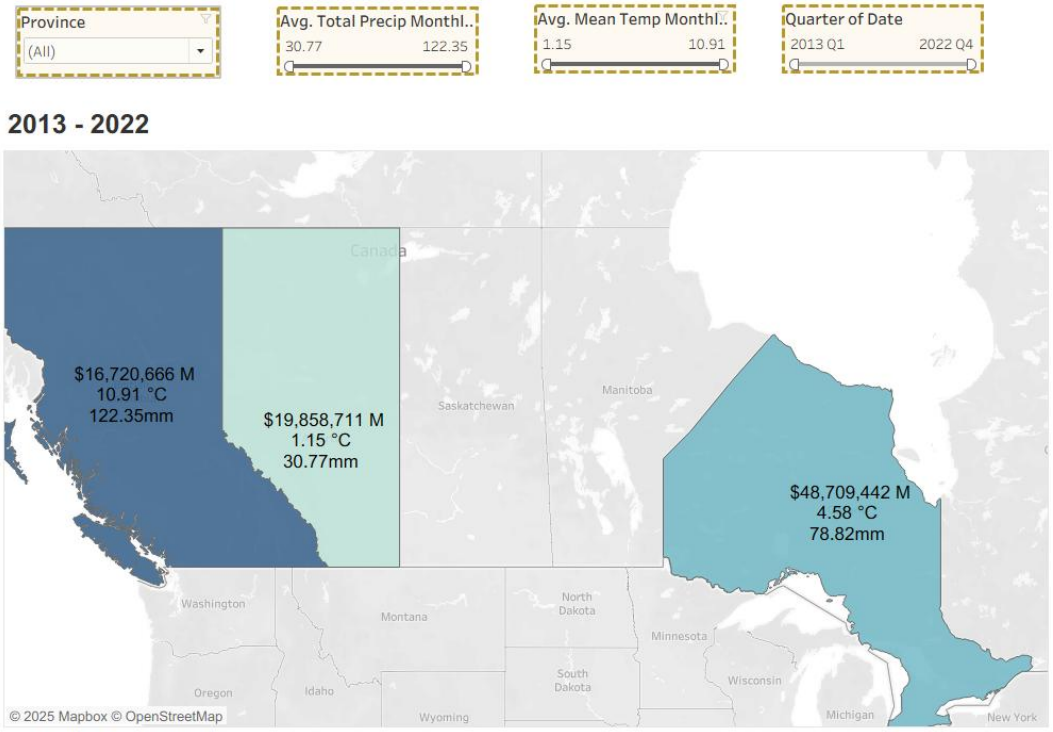

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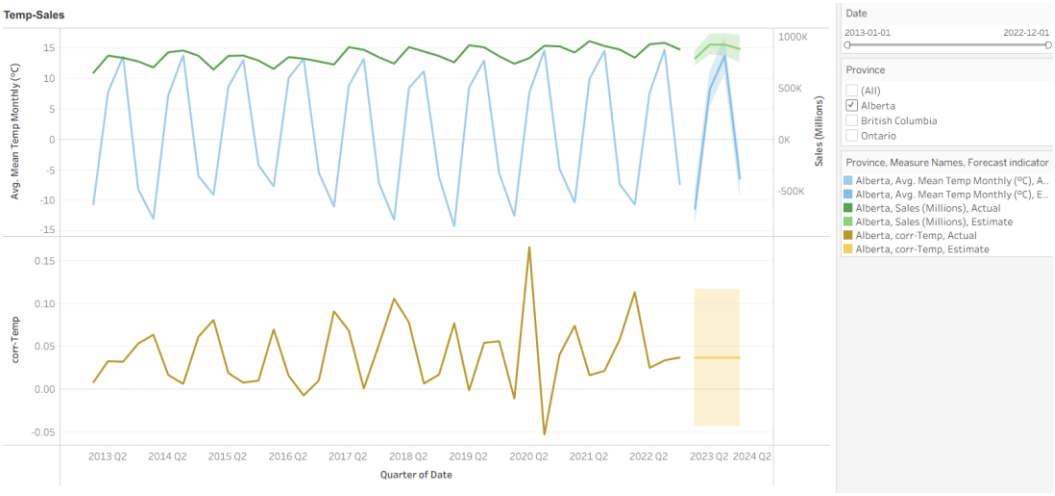

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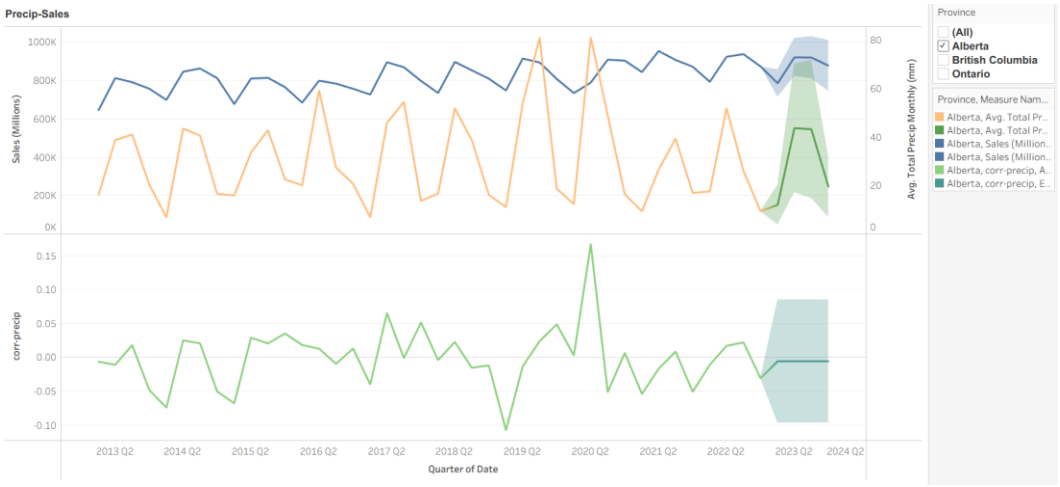

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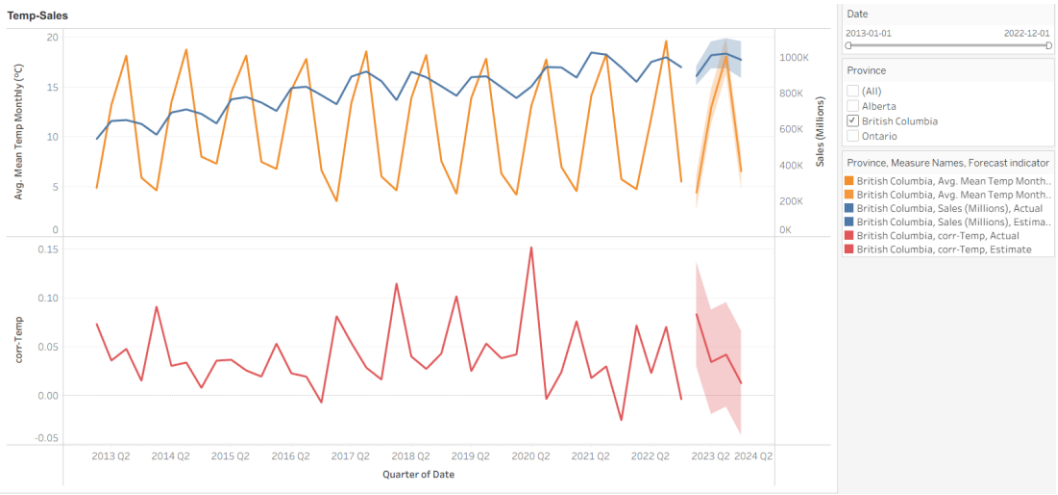

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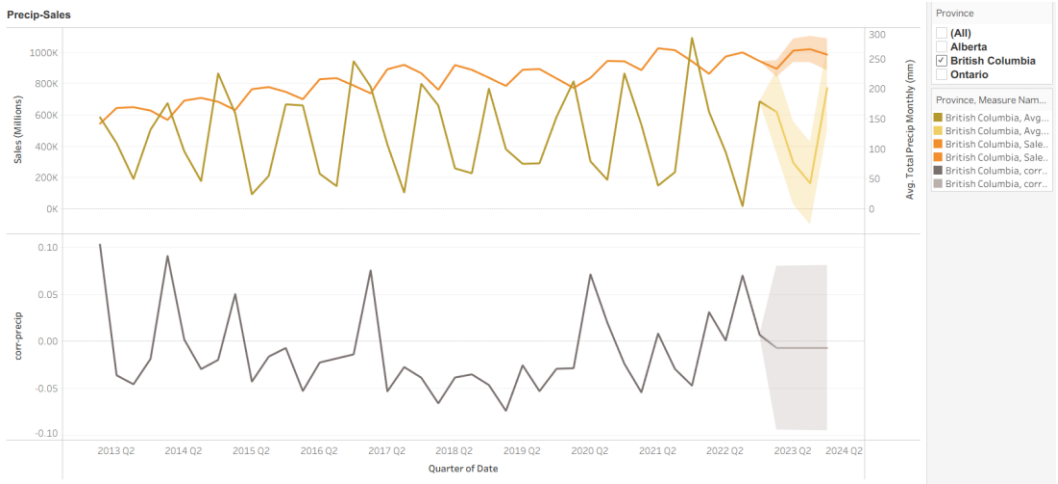

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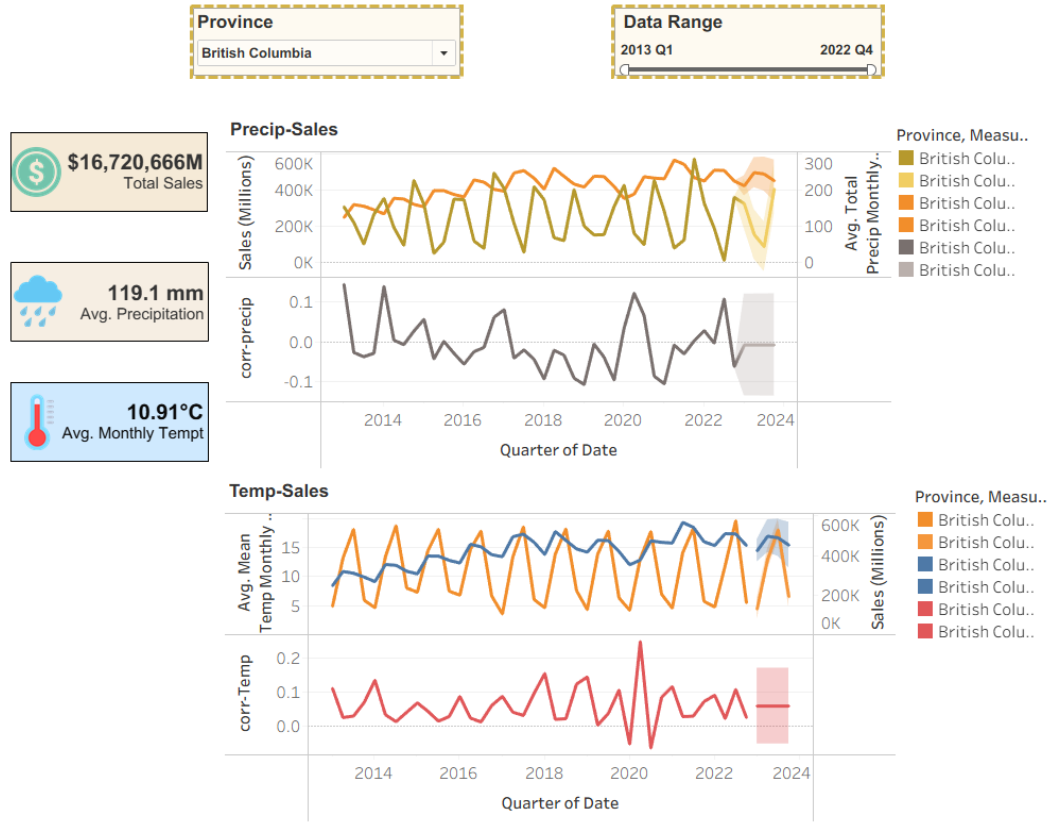

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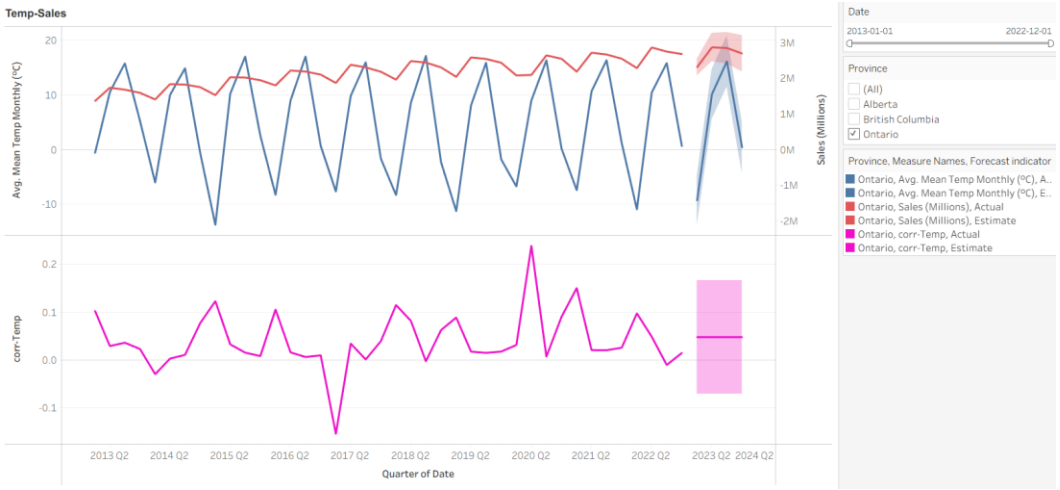

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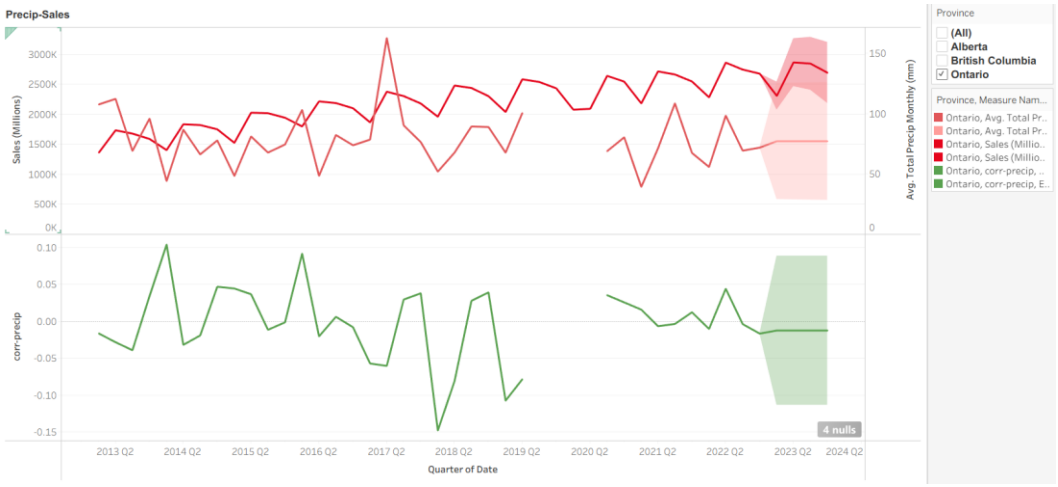

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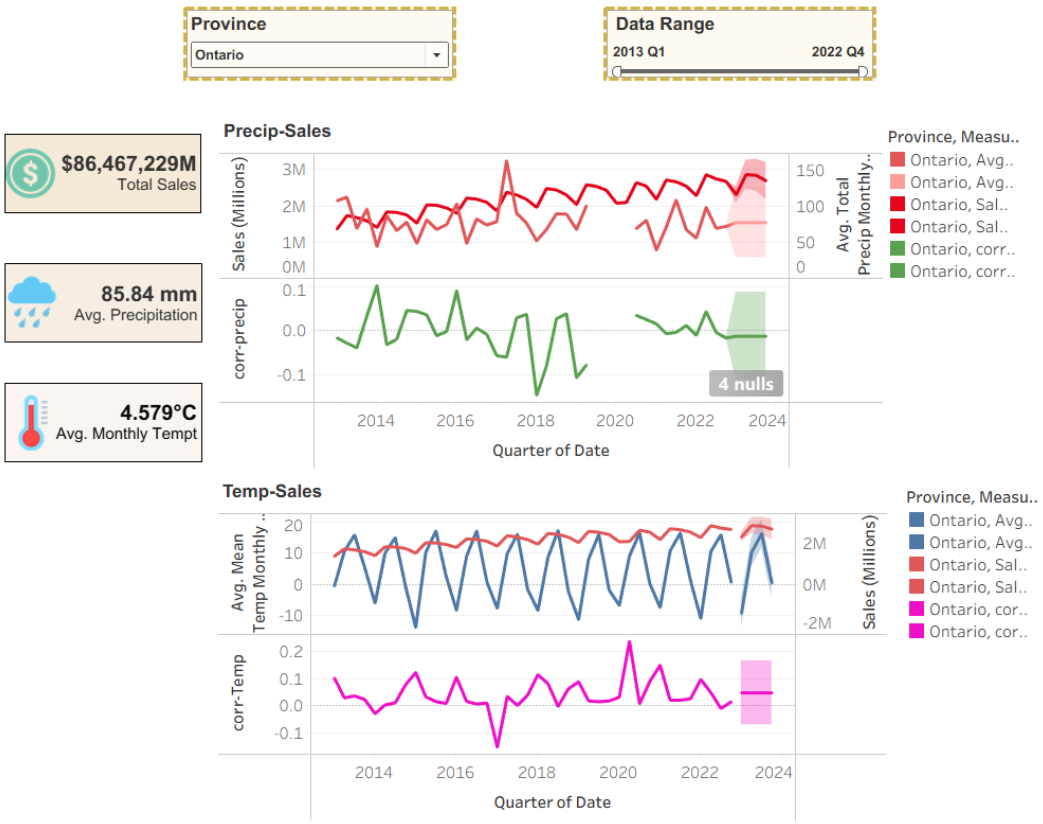

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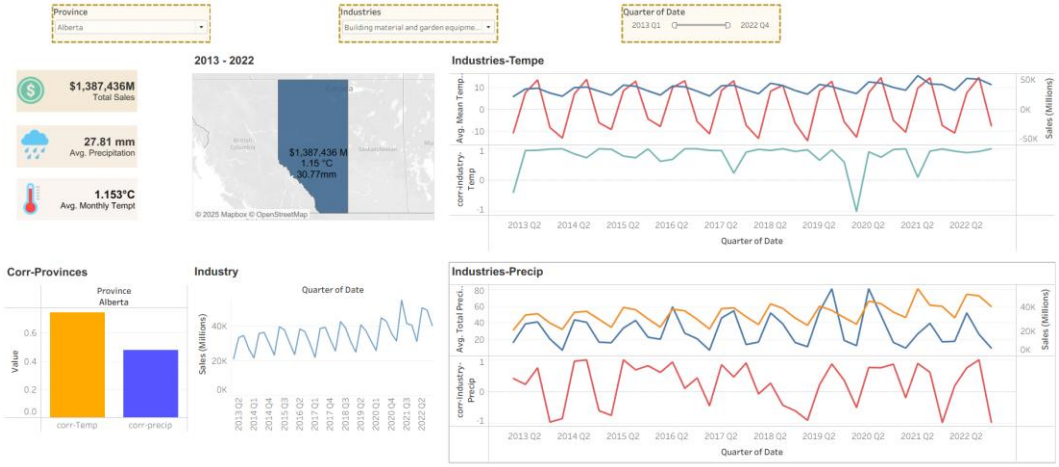

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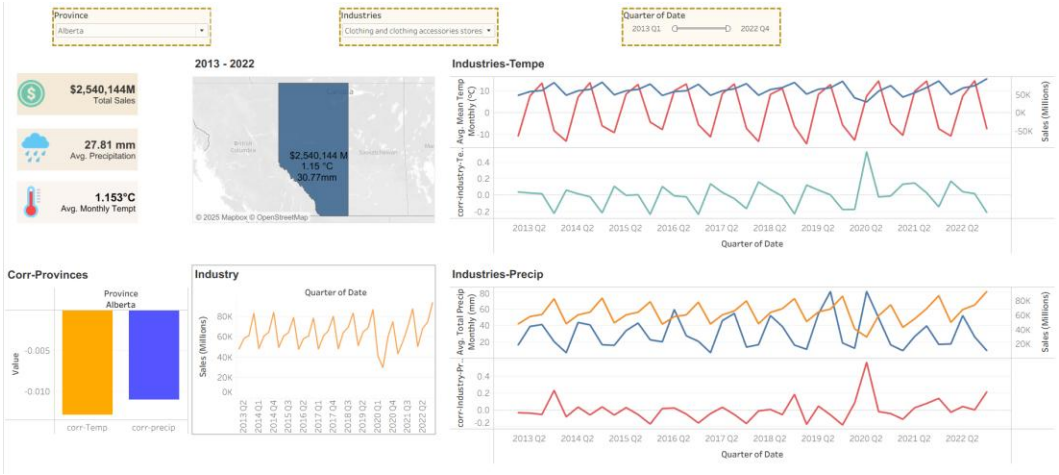

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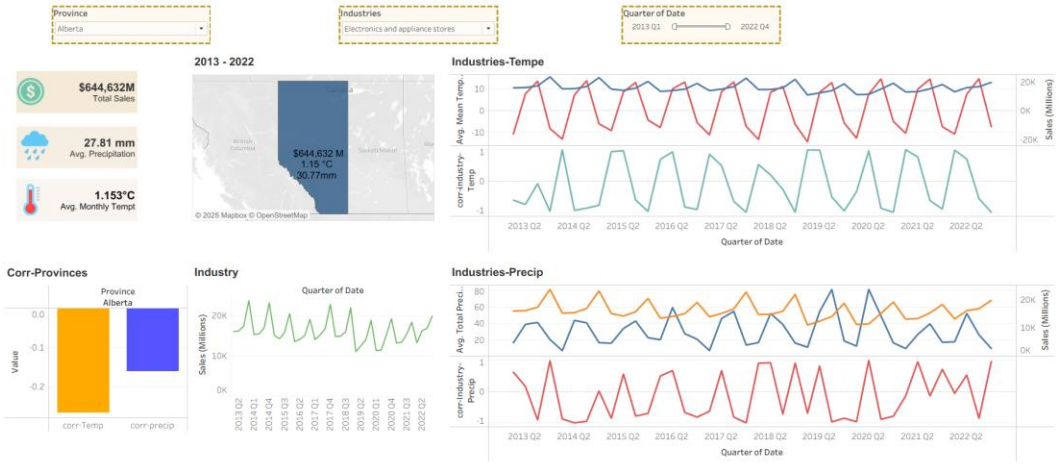

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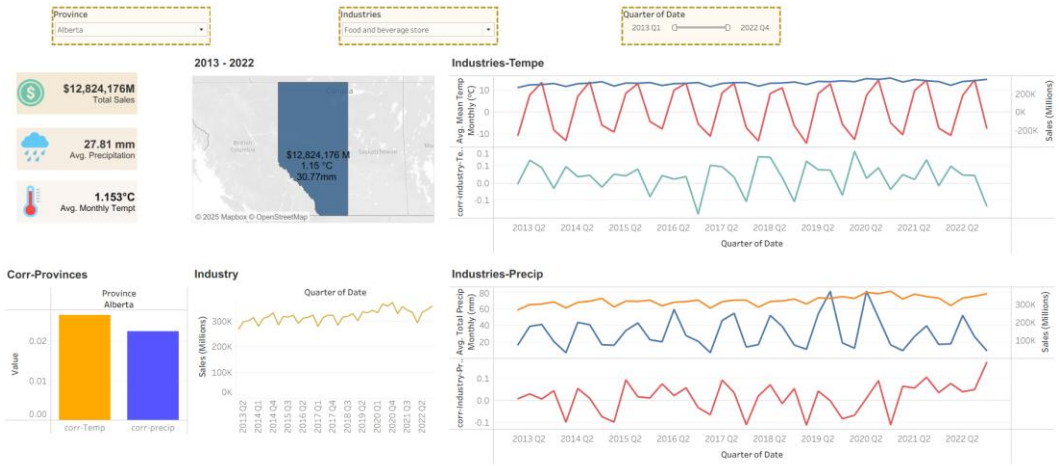

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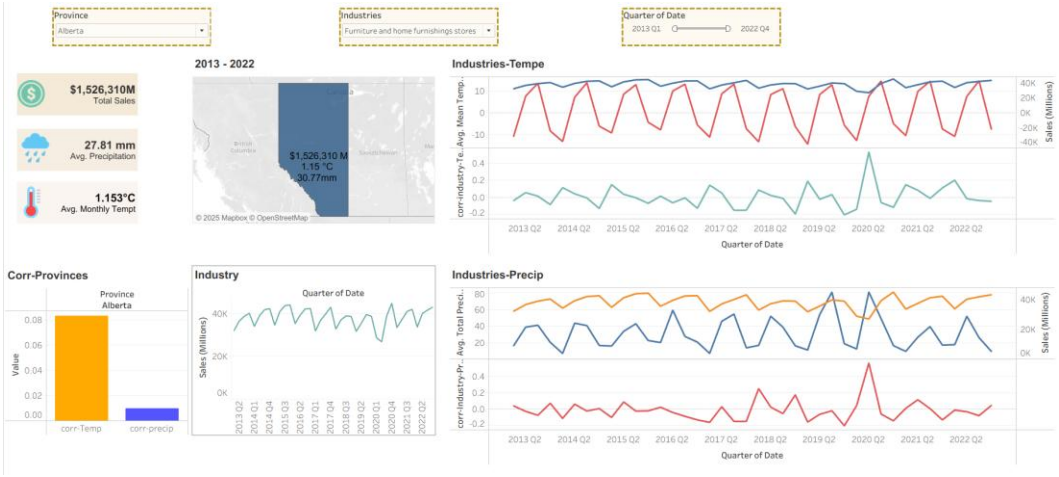

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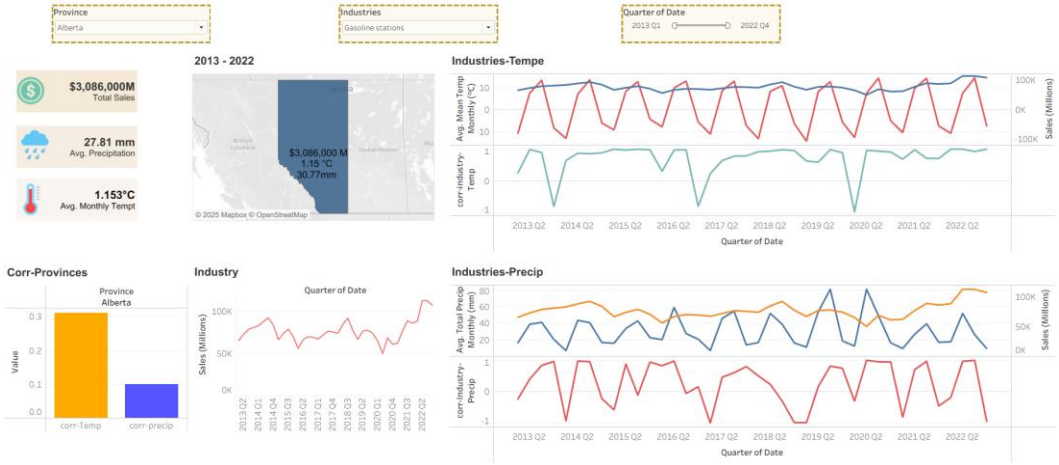

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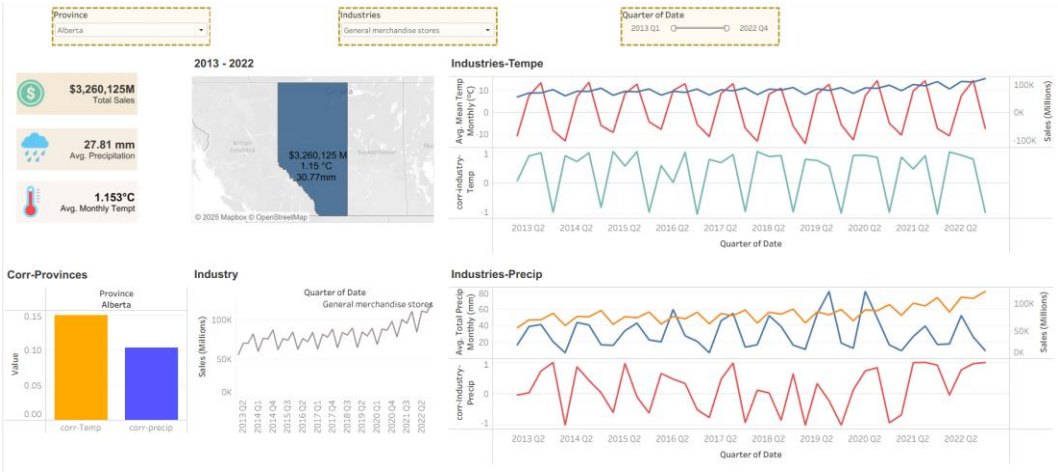

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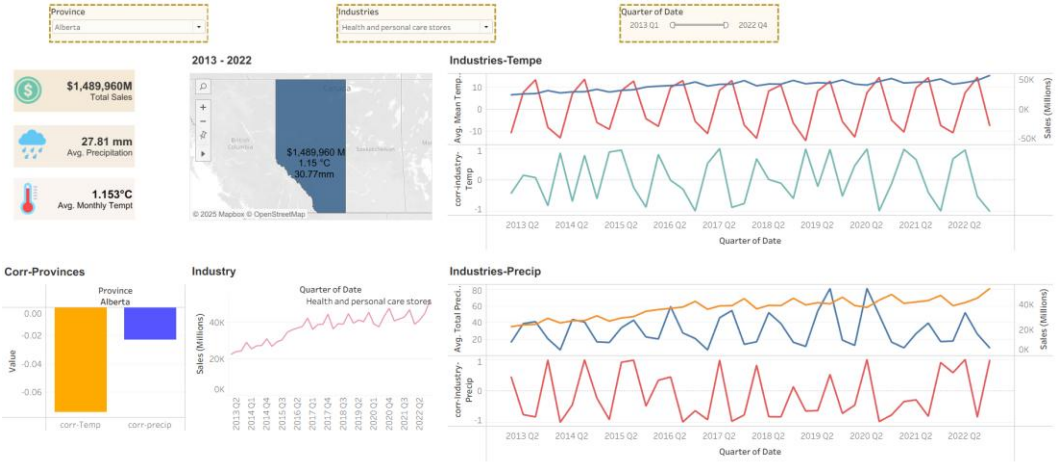

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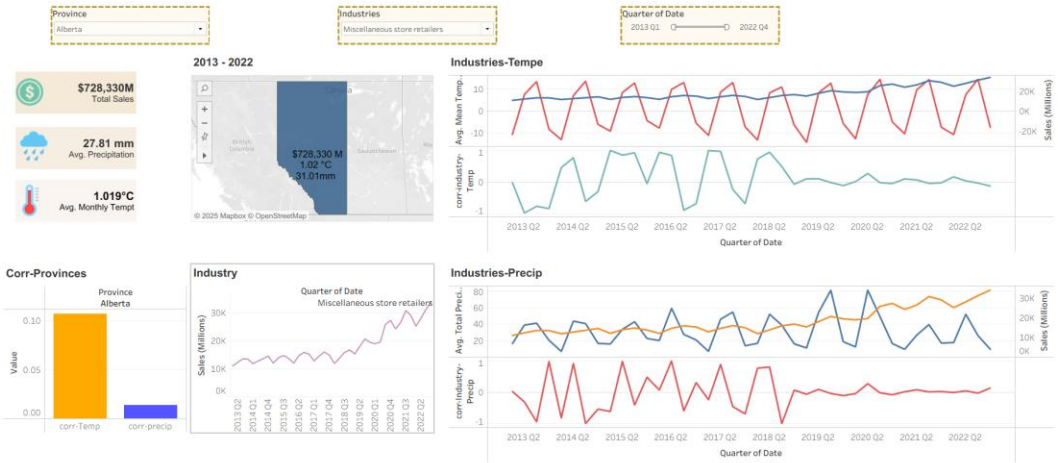

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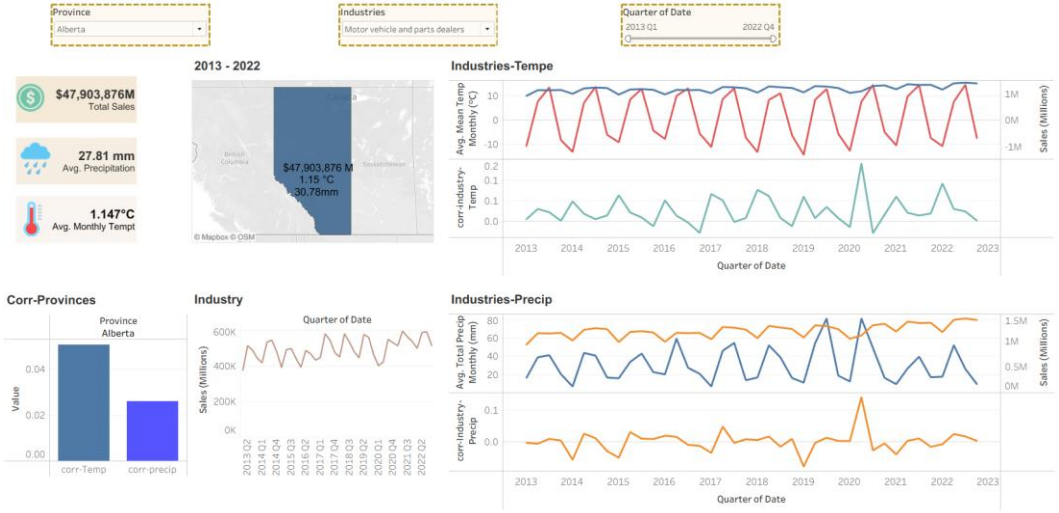

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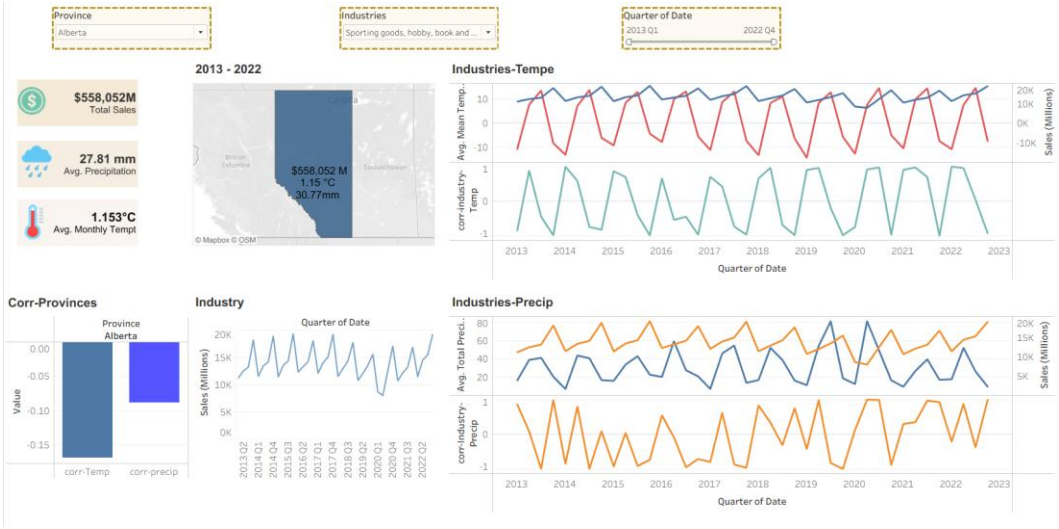

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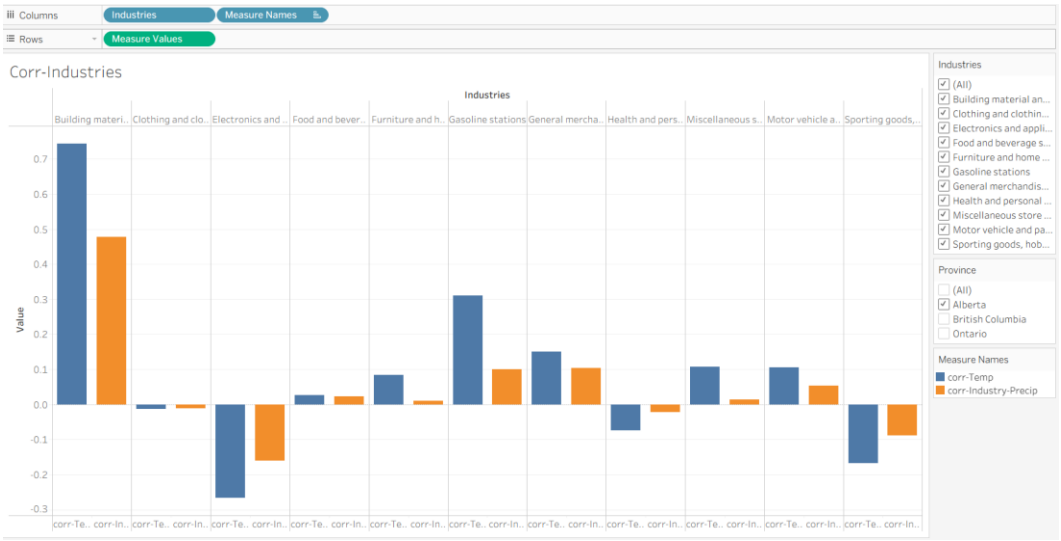

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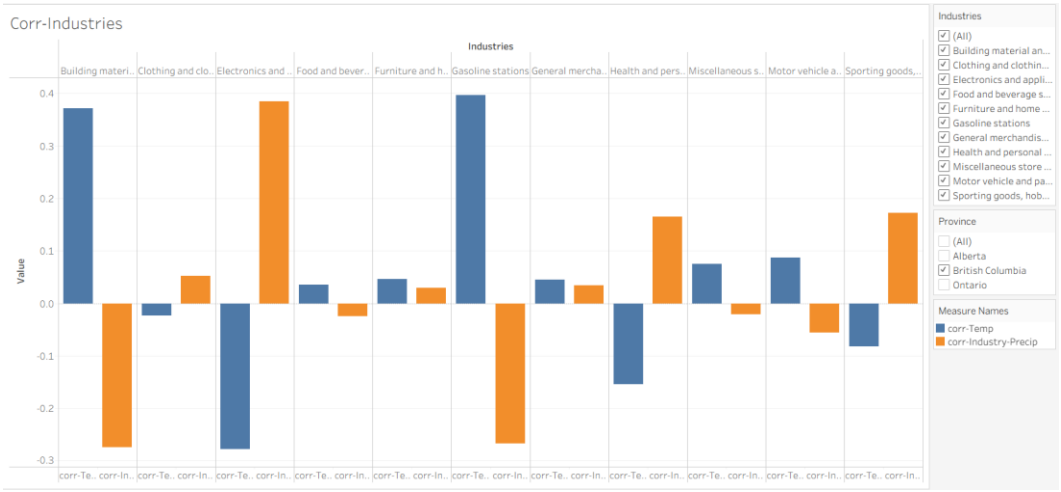

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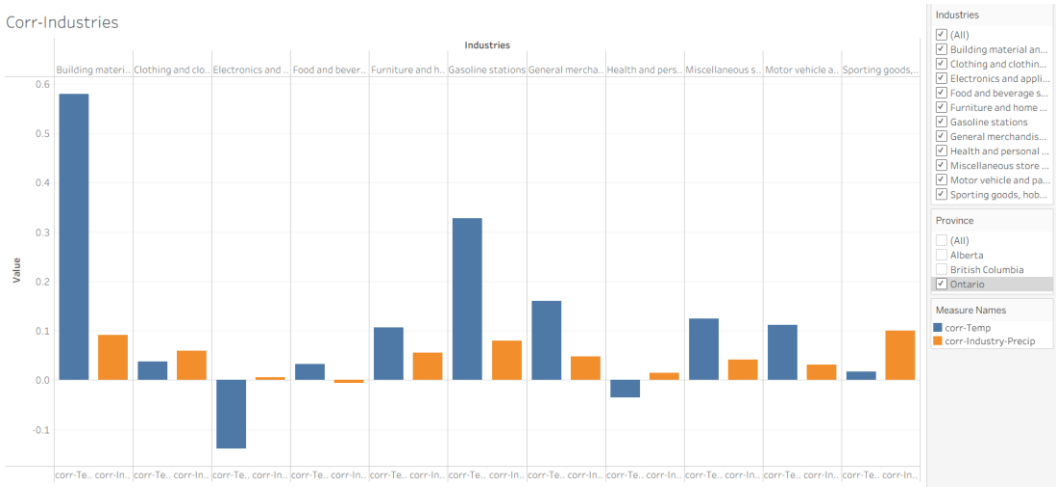

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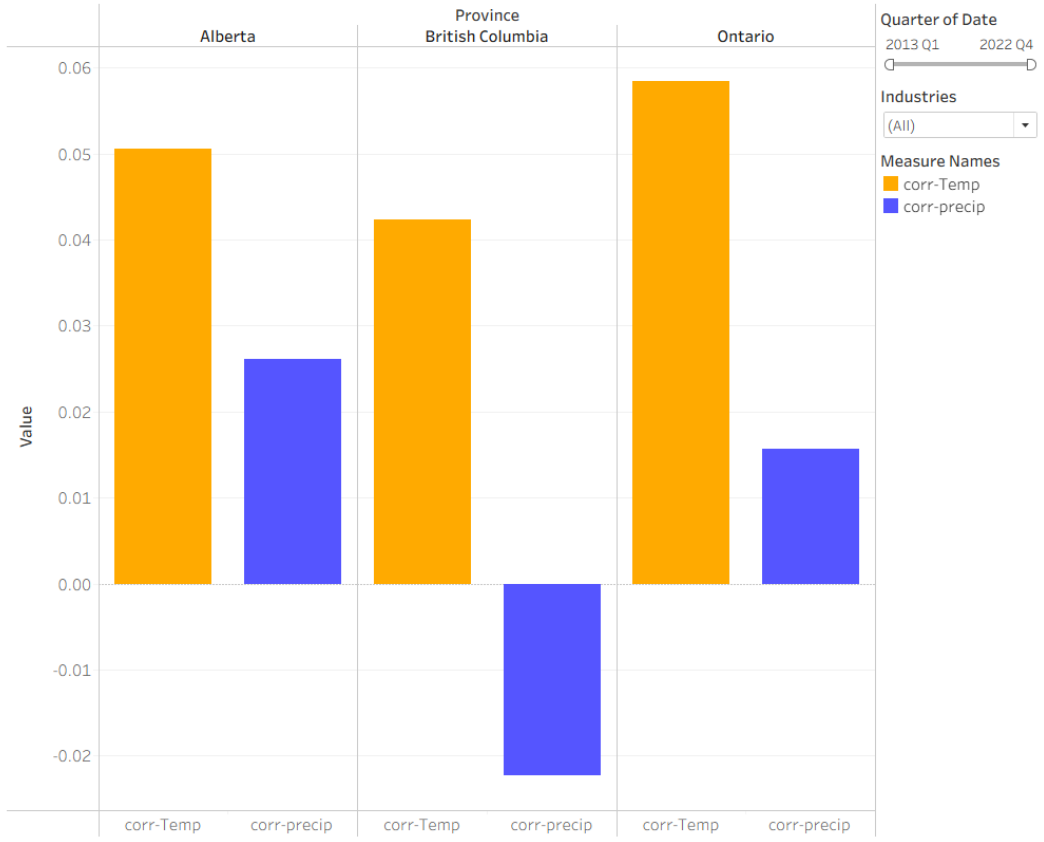

[i] https://climate.weather.gc.ca/historical_data/search_historic_data_e.html1
[ii] https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=2010000801